Impact of EAB Quarantine on Forest Management

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Outline

- EAB quarantine in North America and Minnesota
- What would be the quarantine process in Northern Minnesota?
- How the EAB quarantine works
- Working within the EAB quarantine

- EAB cold tolerance research in Minnesota

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EAB Quarantine in North America and Minnesota

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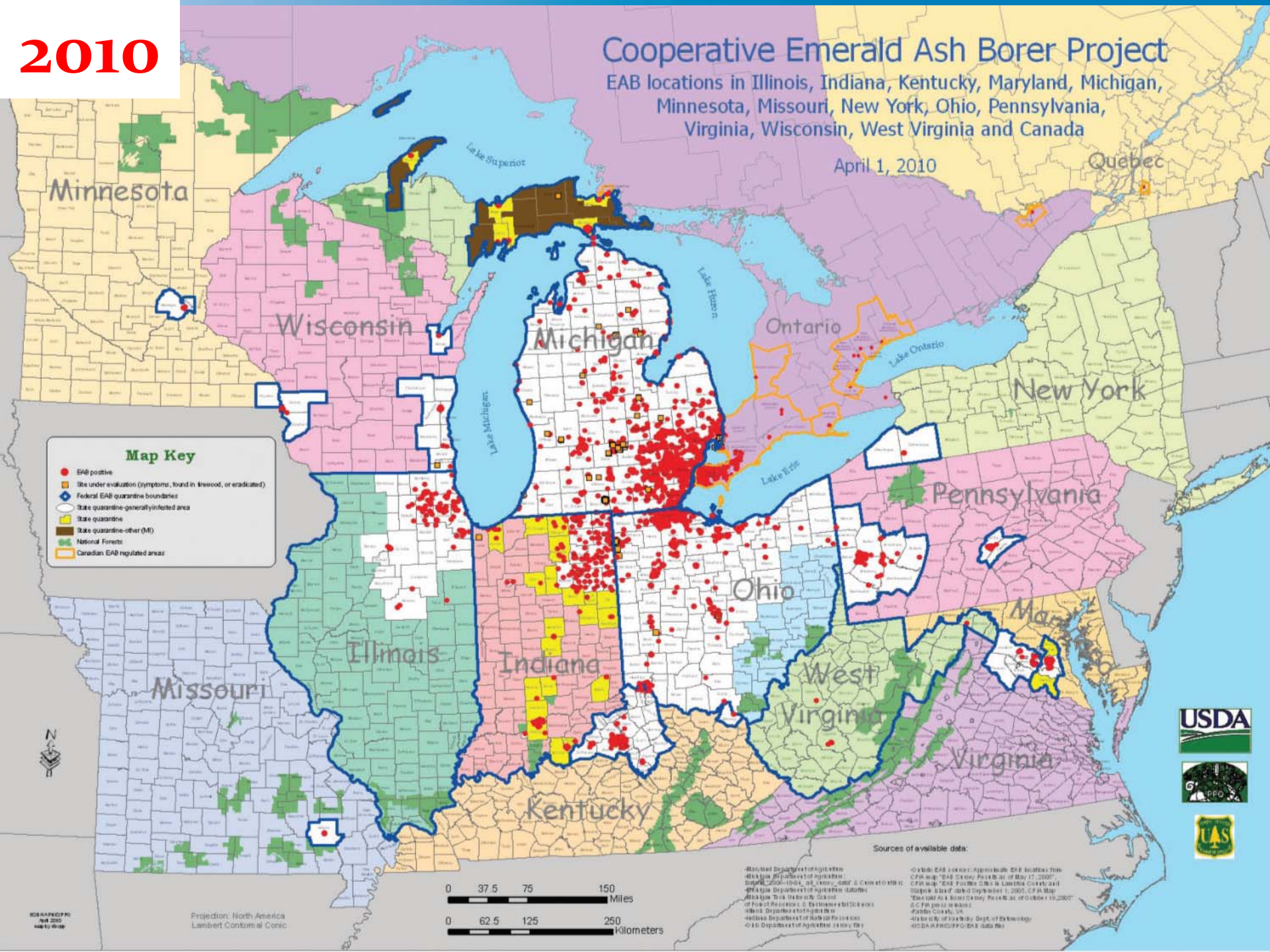
2010


Cooperative Emerald Ash Borer Project
EAB locations in Illinois, Indiana, Kentucky, Maryland, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Virginia, Wisconsin, West Virginia and Canada
April 1, 2010
Minnesota
Wisconsin
Michigan
Ontario
Quebec
New York
Pennsylvania
Ohio
Illinois
Indiana
Missouri
Kentucky
West Virginia
Virginia
Lake Superior
Lake Huron
Lake Michigan
Lake Erie
Lake Ontario
Map Key
EAB positive
Site under evaluation (symptoms, found in firewood, or eradicated)
Federal EAB quarantine boundaries
State quarantine-generally infested area
State quarantine
State quarantine-other (MI)
National Forests
Canadian EAB regulated areas
N
0 37.5 75 150 Miles
0 62.5 125 250 Kilometers
Projection: North America Lambert Conformal Conic
Sources of available data:
USDA

EAB Quarantine in Minnesota

- April 2009, Houston County
- May 2009, Ramsey and Hennepin Counties

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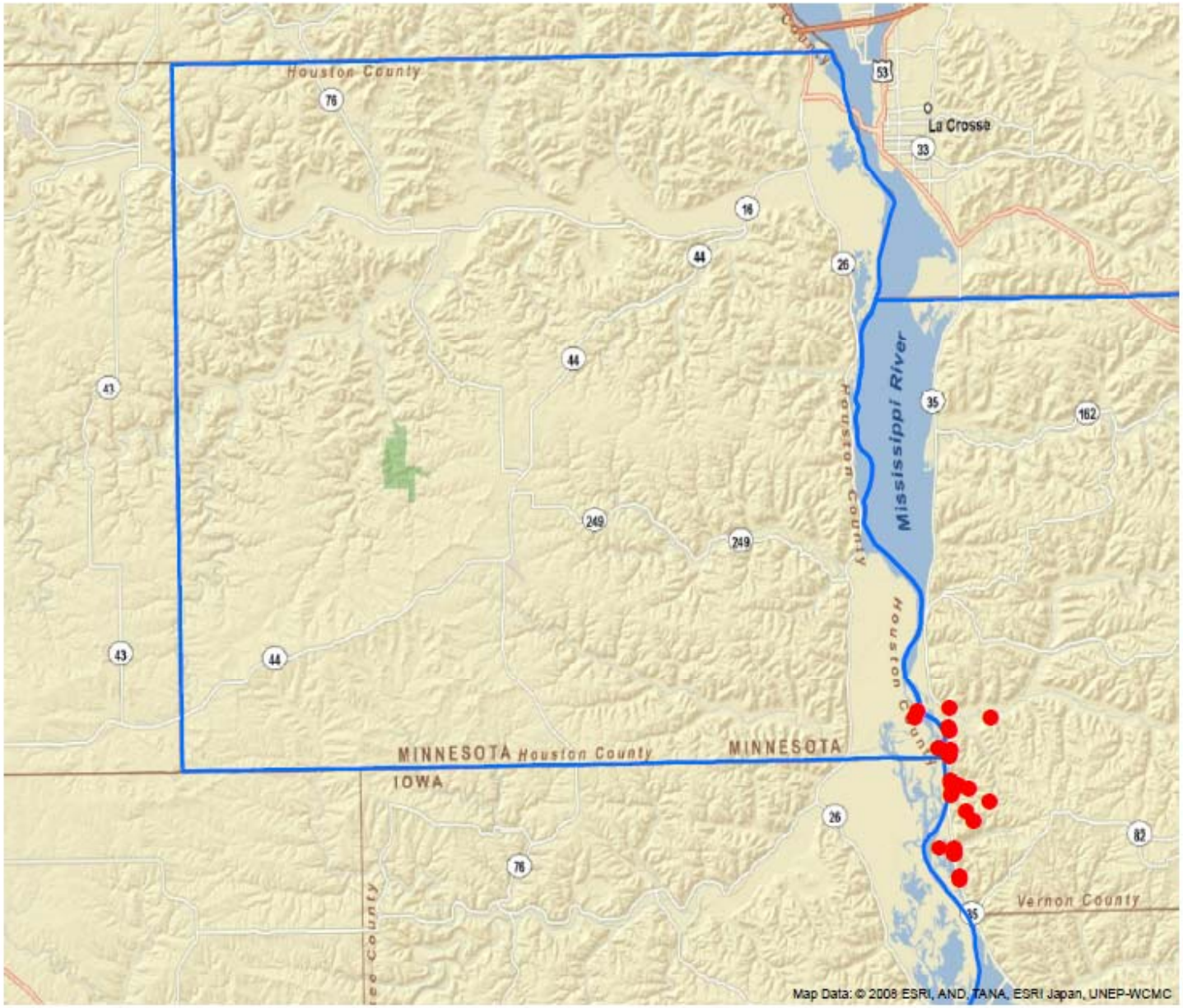
Houston County



EAB in Minnesota
2010

Legend

- Positive Trees
- State / Federal Quarantine

N

0 3 6 Miles

Map updated 4/5/2010

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Area of Detail Highlighted in Red

In accordance with the American Disabilities Act, an alternative form of this communication is available upon request

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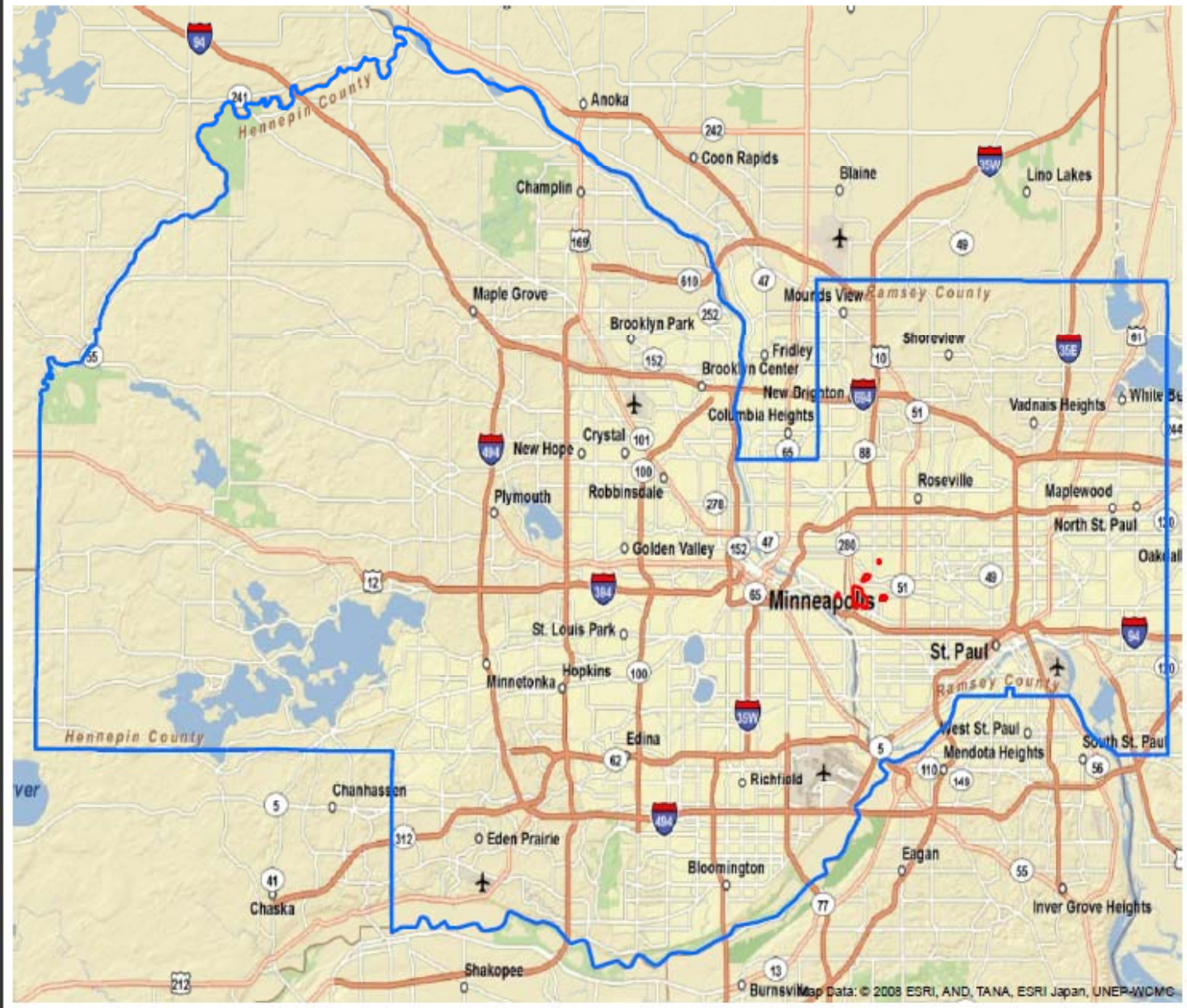
Ramsey and Hennepin Counties



EAB in Minnesota
2010

Legend

- Known EAB-Infested Areas
- State / Federal Quarantine

N

0 3 6 Miles

Map updated 4/5/2010

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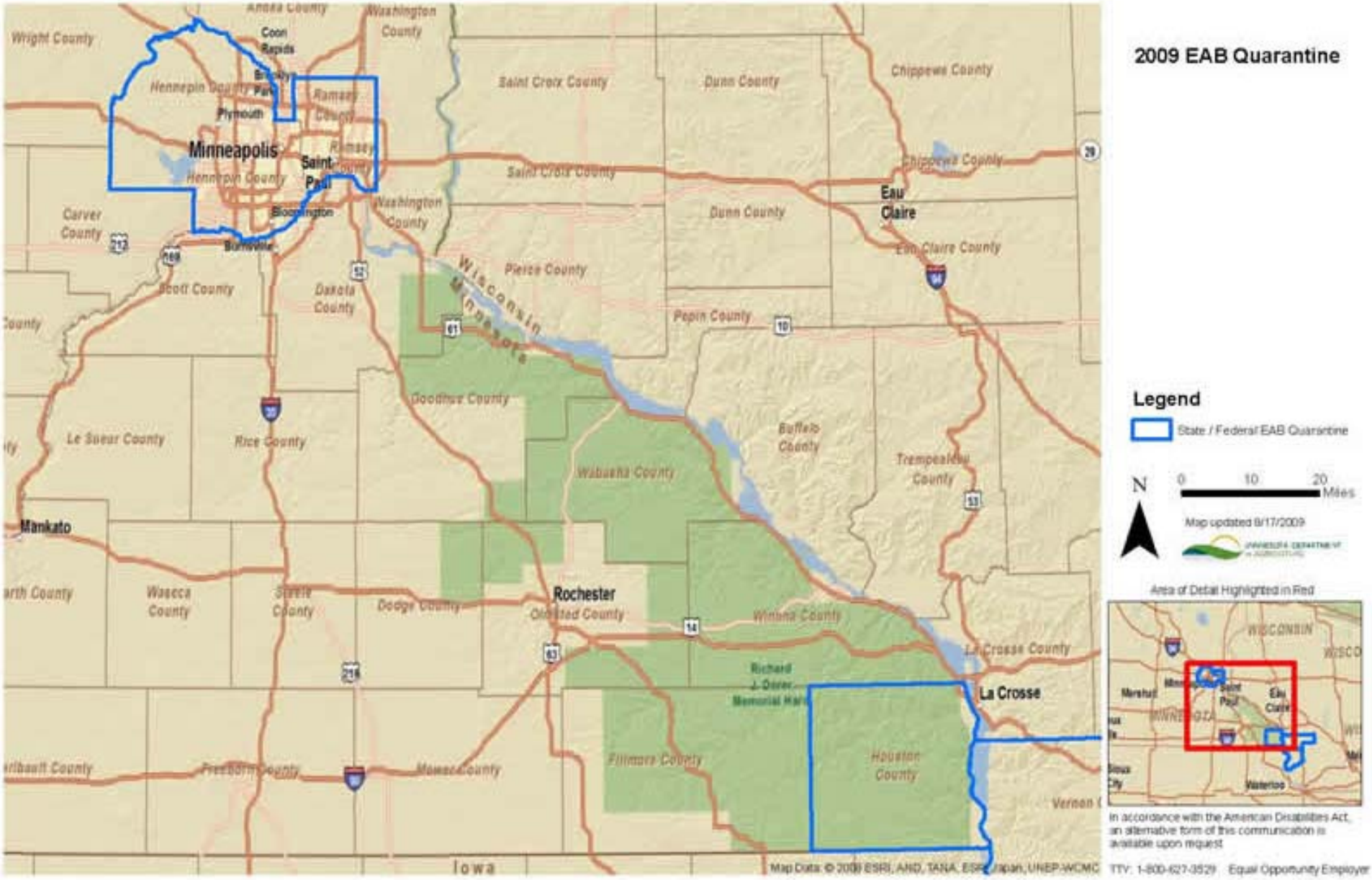
EAB Quarantine in MN



What Would be the Quarantine Process in Northern Minnesota?

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Quarantine Process - Timelines

- EAB discovered and confirmed in new area (~1 day)
- MDA enacts emergency intrastate quarantine (~1 day – 2 weeks)
- USDA enacts matching interstate quarantine (~3 weeks)
- Public meetings with stakeholders
- MDA enacts formal intrastate quarantine (~2-3 months)

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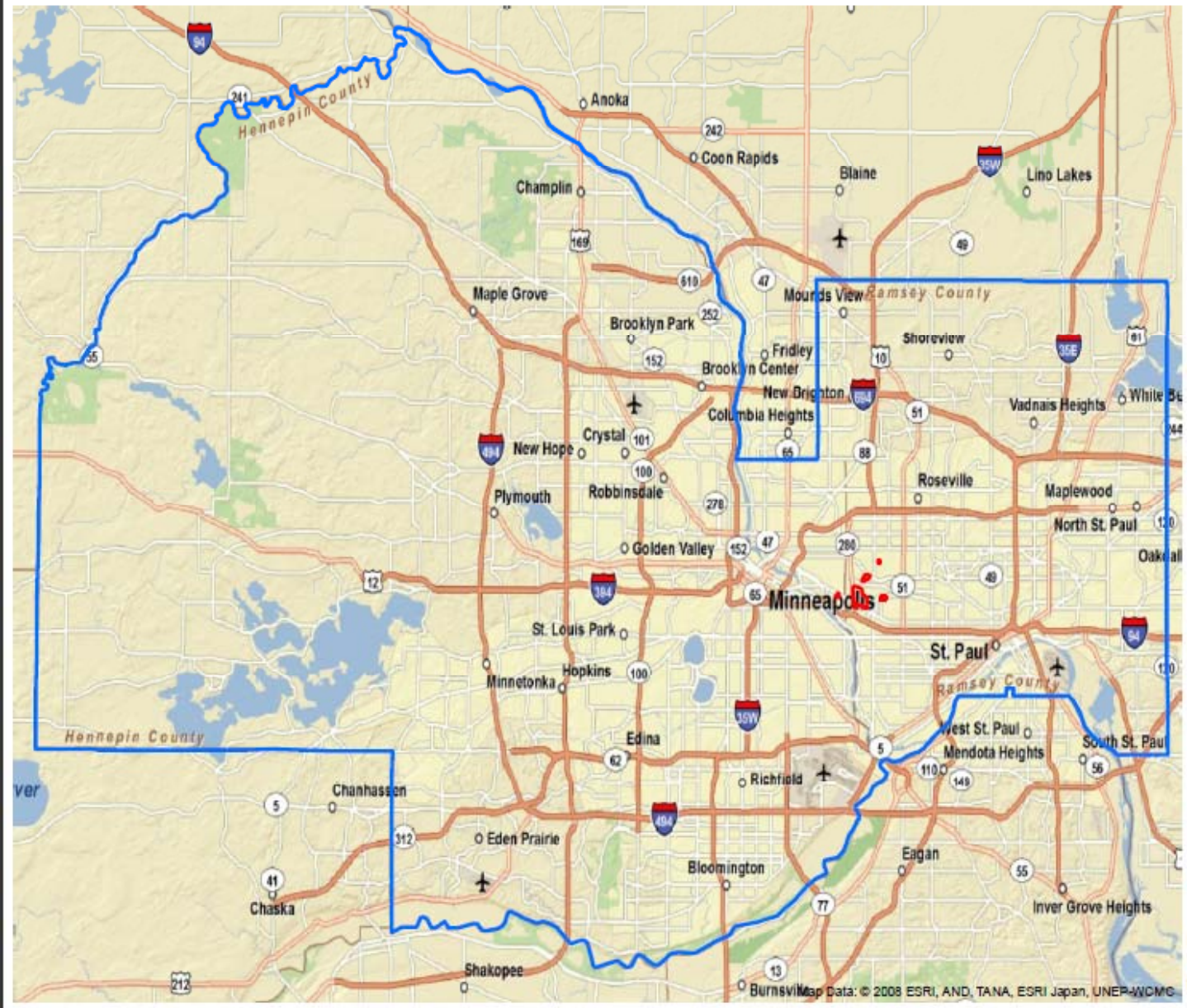
Ramsey and Hennepin Counties



EAB in Minnesota
2010

Legend

- Known EAB-Infested Areas
- State / Federal Quarantine

N

0 3 6 Miles

Map updated 4/5/2010

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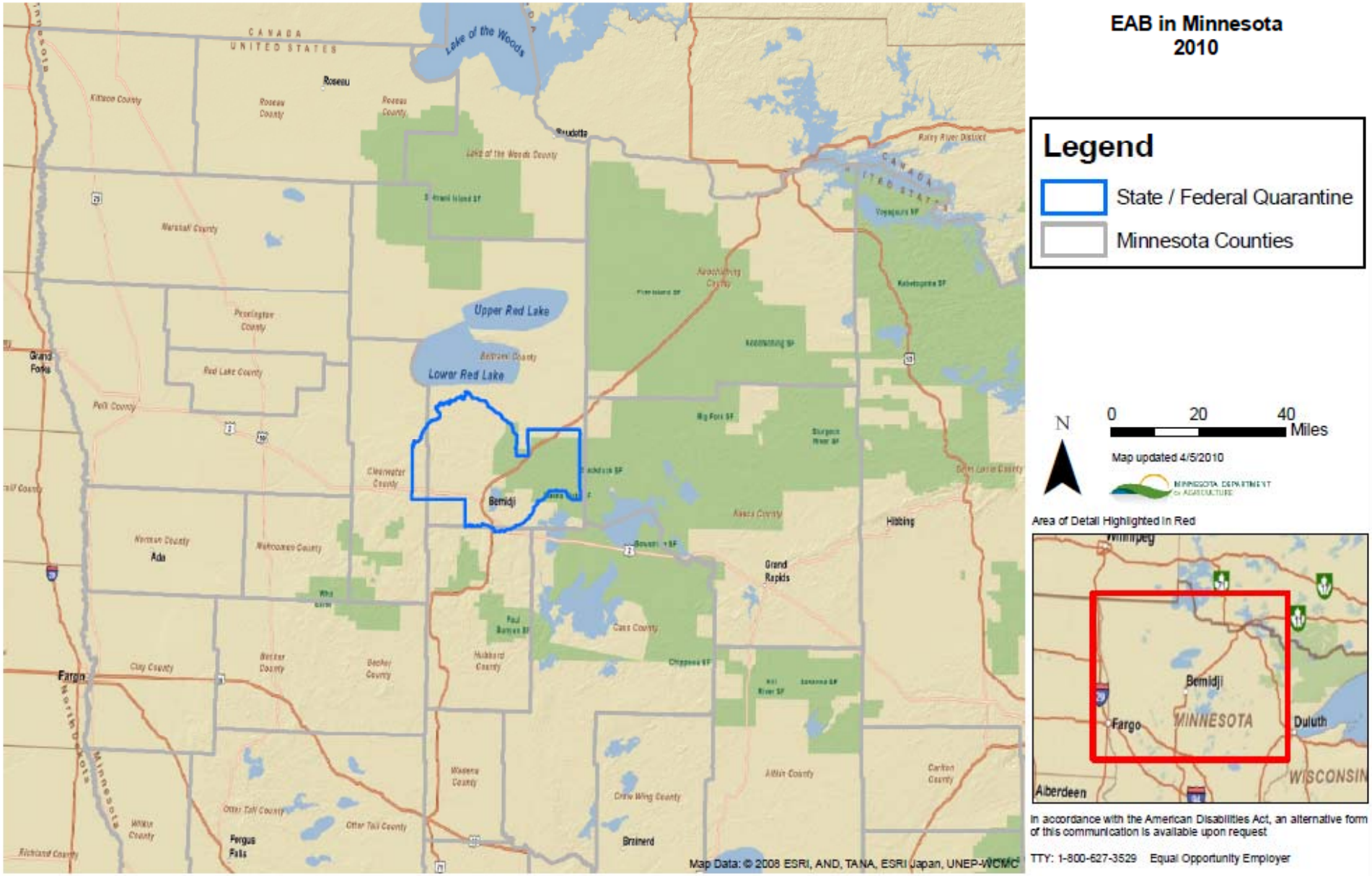
Quarantine Process - How Big?



How the EAB Quarantine Works

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What's regulated?

- **Regulated Articles**
  - Emerald ash borer in any living stage of development
  - Ash trees
  - Ash limbs / branches
  - Ash stumps and roots
  - Ash logs
  - Ash chips (wood or bark)
  - Firewood of any non-coniferous species

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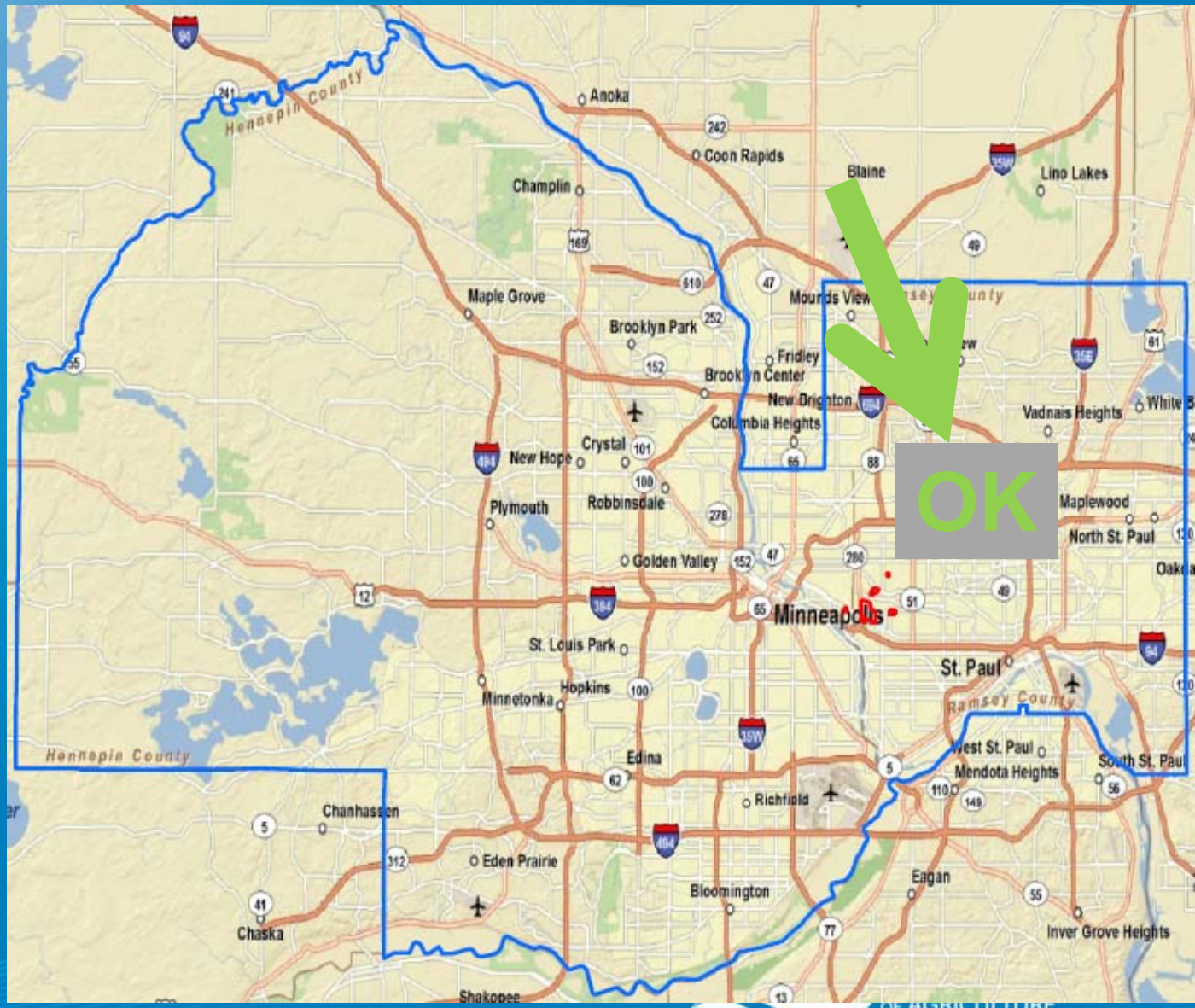
Moving Regulated Articles

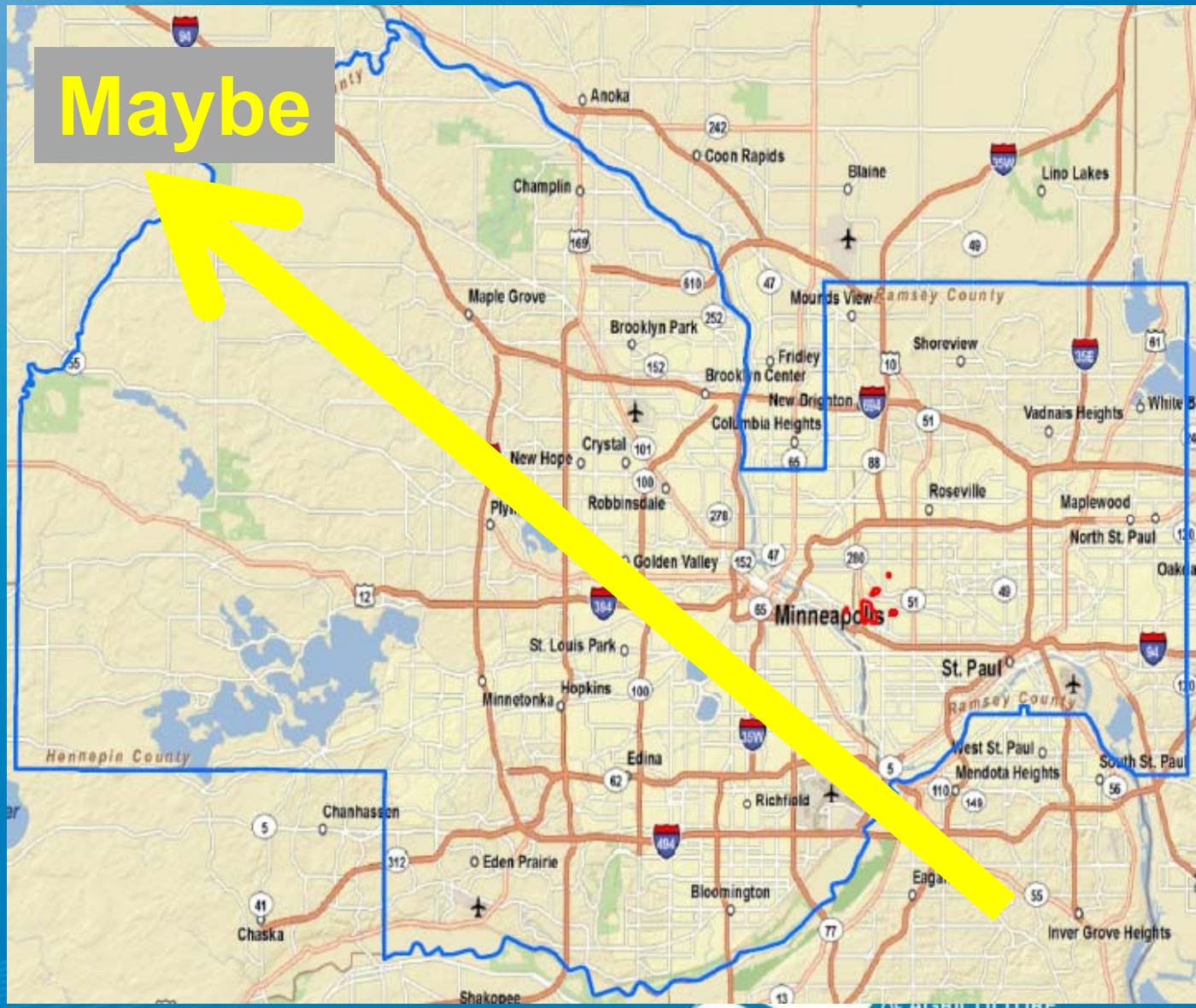
Moving Regulated Articles

- There is no regulation on movement into the quarantine
- However, once in the quarantine the wood becomes regulated…



Moving Regulated Articles

- **Unless the wood is only transiting the quarantine**
- **Require-ments for transiting depend on time of year**



Transit of Regulated Articles

Flight Season	J	F	M	A	M	J	J	A	S	O	N	D
USDA												
MDA												

- Non-flight season – no restrictions
- Flight season – ship enclosed or don't stop

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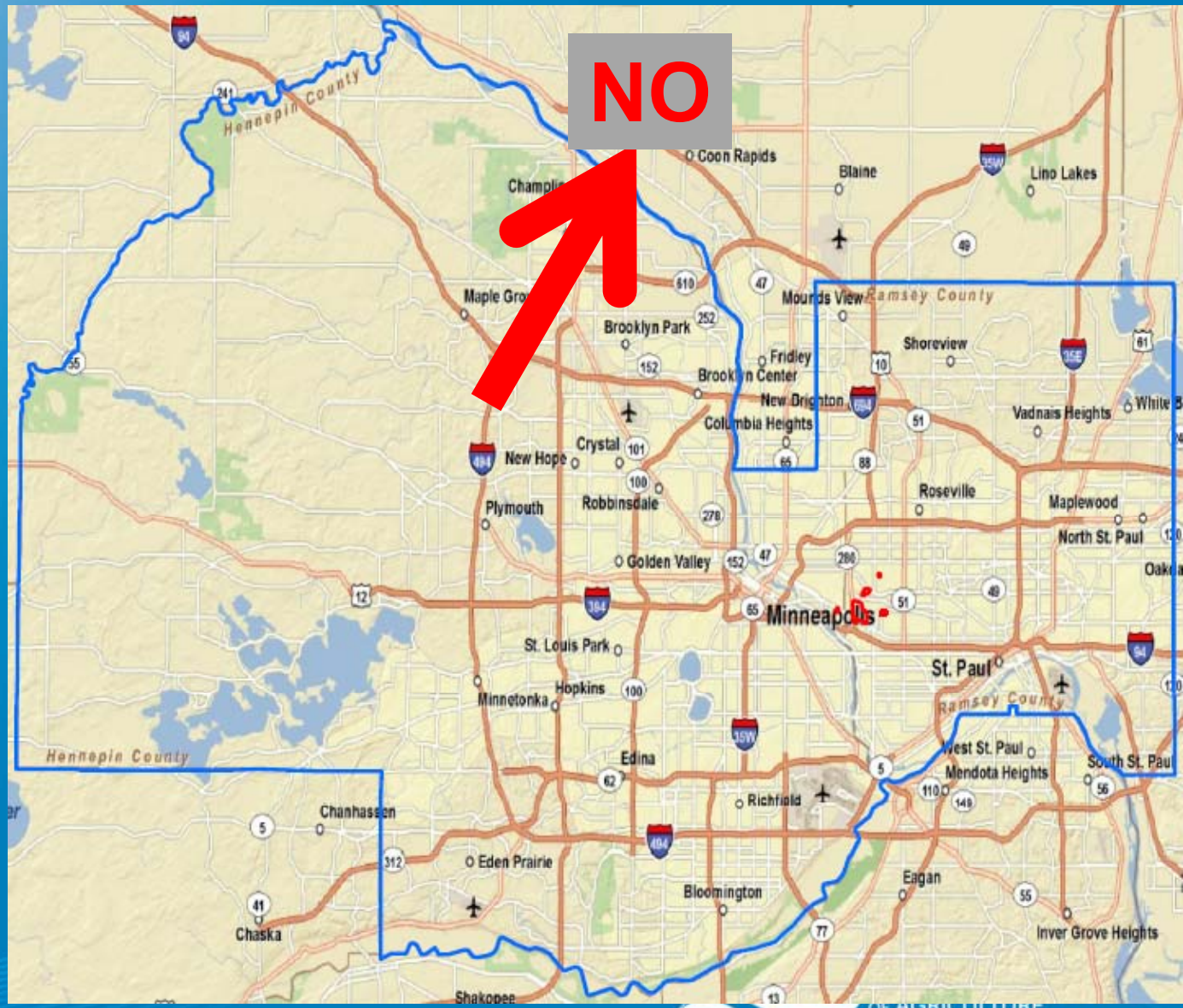
Moving Regulated Articles

- Movement of any regulated articles out of quarantine is prohibited regardless of time of year, unless…



Moving Regulated Articles

- Regulated articles can leave quarantine under a Compliance Agreement
- Compliance Agreement outlines treatment / handling of materials to reduce risk of moving pest

Compliance Agreements

- Compliance Agreement with MDA
  - Movement out of county
- Compliance Agreement w/ MDA / USDA
  - Movement out of county and out of state

MINNESOTA DEPARTMENT OF AGRICULTURE
COMPLIANCE AGREEMENT

1. Name or Address of Person or Firm:	2. Location:
NAME: ESTABLISHMENT: ADDRESS: CITY, STATE, ZIP:	ADDRESS: CITY, STATE, ZIP: COUNTY: PHONE:

3. Regulated Article(s): **Approved Establishment Inside Quarantined Area Handling Ash Logs, Lumber, Stumps, Roots, Limbs, Branches, Chips, Mulch and All Hardwood Firewood**

4. Applicable Laws/Regulations: **Emerald Ash Borer (*Agrilus planipennis*), MN Statutes 18G, 18J, 239 and the State of Minnesota EAB Interior Quarantine**

Section I. Agreement

I/We agree to the following: **[Name of Operation]** hereby enters into a Compliance Agreement with the Minnesota Department of Agriculture (MDA) under the provisions of the Emerald Ash Borer quarantine and agrees to handle regulated articles intrastate only as provided for on this Compliance Agreement.

Section II. Conditions

☐ This establishment will not move regulated articles out of the quarantined area. If these practices change this establishment will contact Teresa McDill with MDA at 651-201-6448, before the change occurs to give notification and ensure adherence to the State Quarantine.

☐ This establishment will move ONLY **treated** (see subsection A.) regulated (circle all that apply) ash logs, lumber, stumps, roots, limbs, branches, chips, mulch, wood packing material (WPM), or hardwood firewood intrastate from a quarantined area.

☐ This establishment is located outside of a quarantine area and will accept untreated regulated (circle all that apply) ash logs, lumber, stumps, roots, limbs, branches, chips, mulch and/or hardwood firewood moved intrastate from a quarantined area only during the period of September 1 – April 30. This facility will ensure that ALL regulated material will be **treated** (see subsection A.) by April 30. Any untreated material remaining after April 30 will be considered a violation of this agreement.

A. Treatment: This establishment will ensure that all regulated articles will be treated properly at the establishment's expense under the treatment option(s) below (circle all that apply):

1. Remove the bark and an additional ½ inch of wood. The bark and wood removed will be regulated separately.
2. Kiln Sterilization Treatment. The maximum thickness of allowable wood is three inches. See Attachment A-1.
3. Fumigate according to a treatment schedule. See Attachment A-2.
4. Heat Treatment. See Attachment A-3.
5. Produce mulch chips that comply with the Mulch and Chip Sampling Protocol provided in Attachment A-4.
6. Composting process as provided in Attachment A-5.
7. Heat Treatment in accordance with Regulated WPM treatment T404-e-2. See Attachment A-6. (WPM only)
8. Ship untreated regulated articles to an approved receiving facility destination without stopping (except for refueling and traffic conditions) during the period of September 1 to April 30. (No shipments of untreated regulated articles are allowed during the period of May 1 to August 31.)

If regulated items are present in violation of this agreement they will be immediately treated/disposed of under the MDA supervision using appropriate safeguards at the establishment's expense.

Compliance Agreements

- Debark (+1/2” wood)
- Heat
  - Kiln Sterilize – wood < 3” thick
  - Heat Treat - Firewood
  - Heat Treat – Wood packing materials
- Mulch
  - Compost
- Fumigate
- Shipping to treatment facility

Compliance Agreements

- Debark (+1/2” wood)

Compliance Agreements

- Heat
  - Kiln Sterilize – wood < 3” thick
  - Moisture / Temperature threshold

Dry Bulb Temperatures	Wet Bulb Depression	Relative Humidity	Moisture Content	Thickness of Lumber	Exposure Time
140^{0}F	7^{0}F	82%	13.8%	1 inch 2 inches 3 inches	3 hrs 5 hrs 7 hrs
130^{0}F	16^{0}F	60%	9.4%	1 inch 2 inches 3 inches	10 hrs 12 hrs 14 hrs

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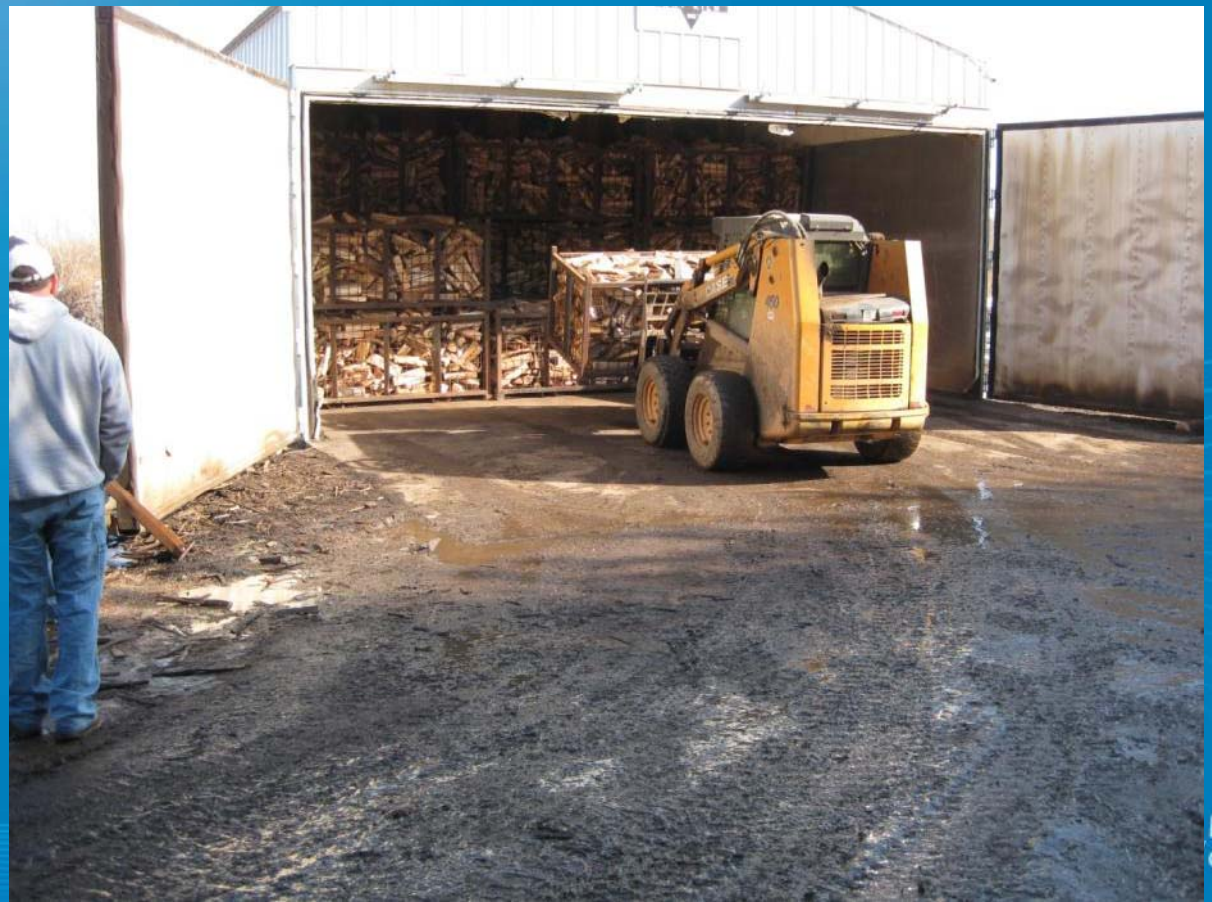
Compliance Agreements

- Heat
  - Heat Treat – Firewood
    - 160 degrees F for 75 minutes



Compliance Agreements

- Heat
  - Heat Treat – Wood packing materials
    - Dunnage, crating, pallets, etc
    - 133 degrees F for 30 minutes

Compliance Agreements

- Mulch
  - Material < 1”x1”

Or

- Compost
  - Pile reaches 140 degrees F for 4 days at least 2 x’s (between turnings)

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Compliance Agreements

- **Fumigate**

Temperature	Dosage Rate (lb/1,000 ft^3	Minimum Concentration (ounces) At:			
		0.5 hr	2 hrs	4 hrs	16 hrs
70°F or above	3 lbs	36	30	27	25
40-69°F	5 lbs	60	51	46	42

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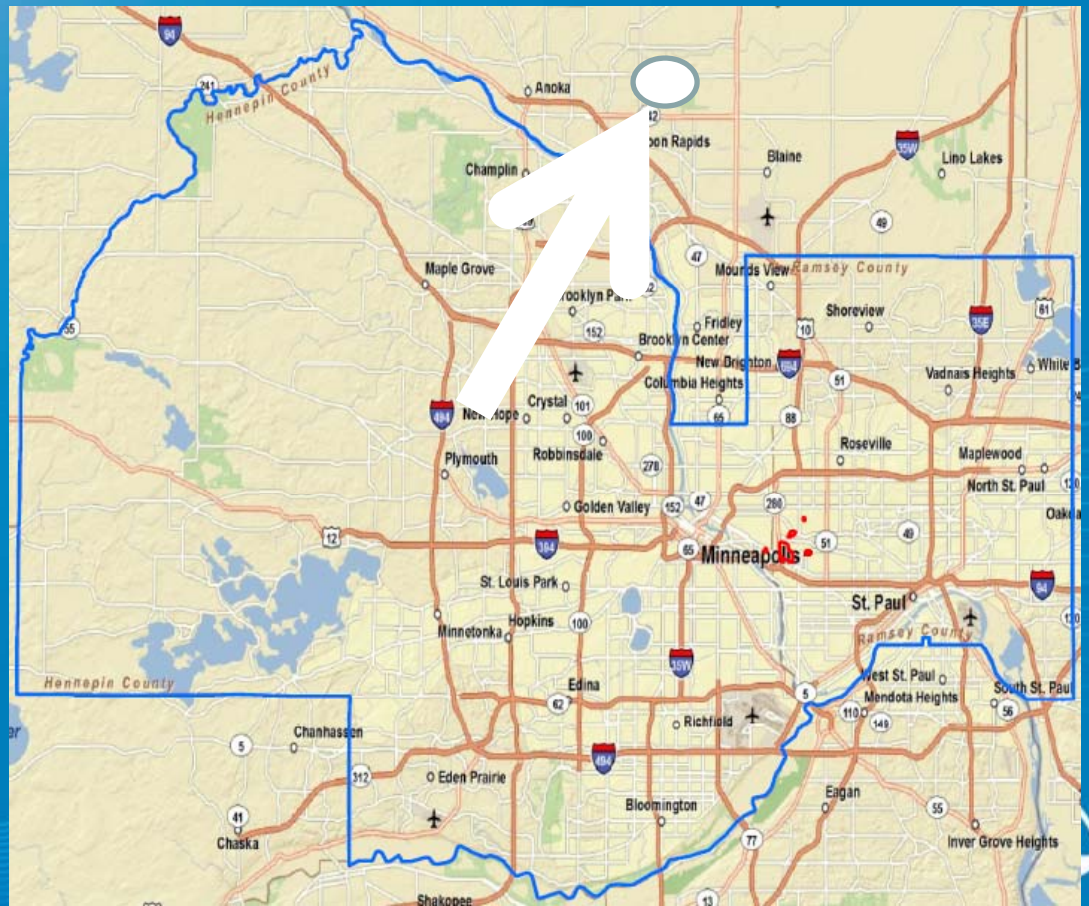
Compliance Agreements

- Shipping to treatment facility
  - Only during non-flight season
  - Processed before flight season



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Working Within the EAB Quarantine

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Steps to slow down EAB population growth and spread

- Identify and remove beetle producing trees
- Draw beetles to sink (sacrificial) trees and remove
- Insecticide treatments for selected trees
- Preemptive removal of undesirable trees

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Identifying Beetle Infested Trees

Identifying Beetle Infested Trees

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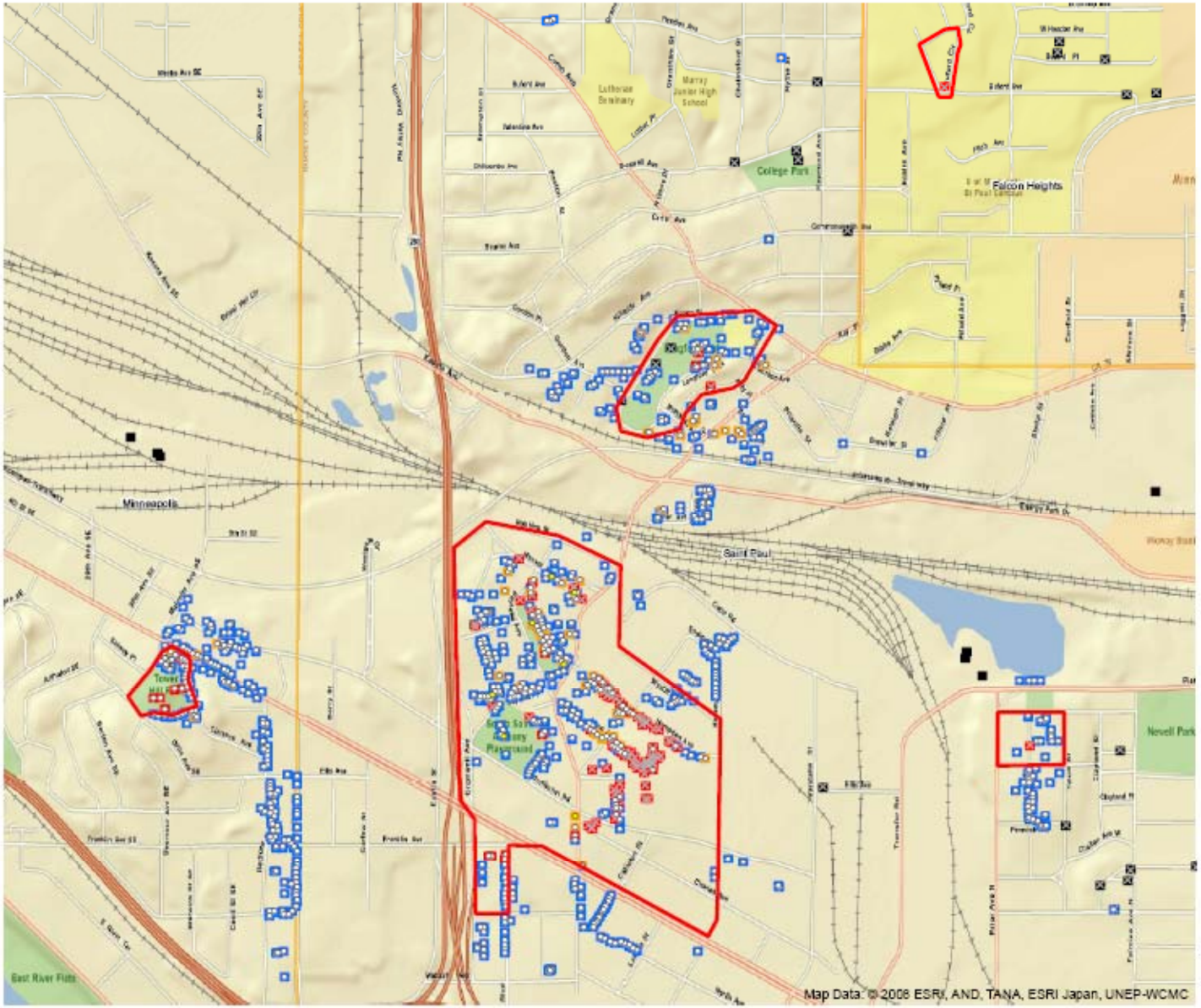
Identifying Beetle Infested Trees

Beetle Broods

Known EAB-Infested Areas



2010 Known EAB-Infested Areas

Known EAB-Infested Areas

Tree Condition

- Removed
- Standing; Girdled
- Standing; Not Girdled

EAB Status

- Positive
- Suspect
- Not Suspect
- Negative

N

0 0.09 0.18 Miles

Map updated 2/12/2010

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Area of Detail Highlighted in Red

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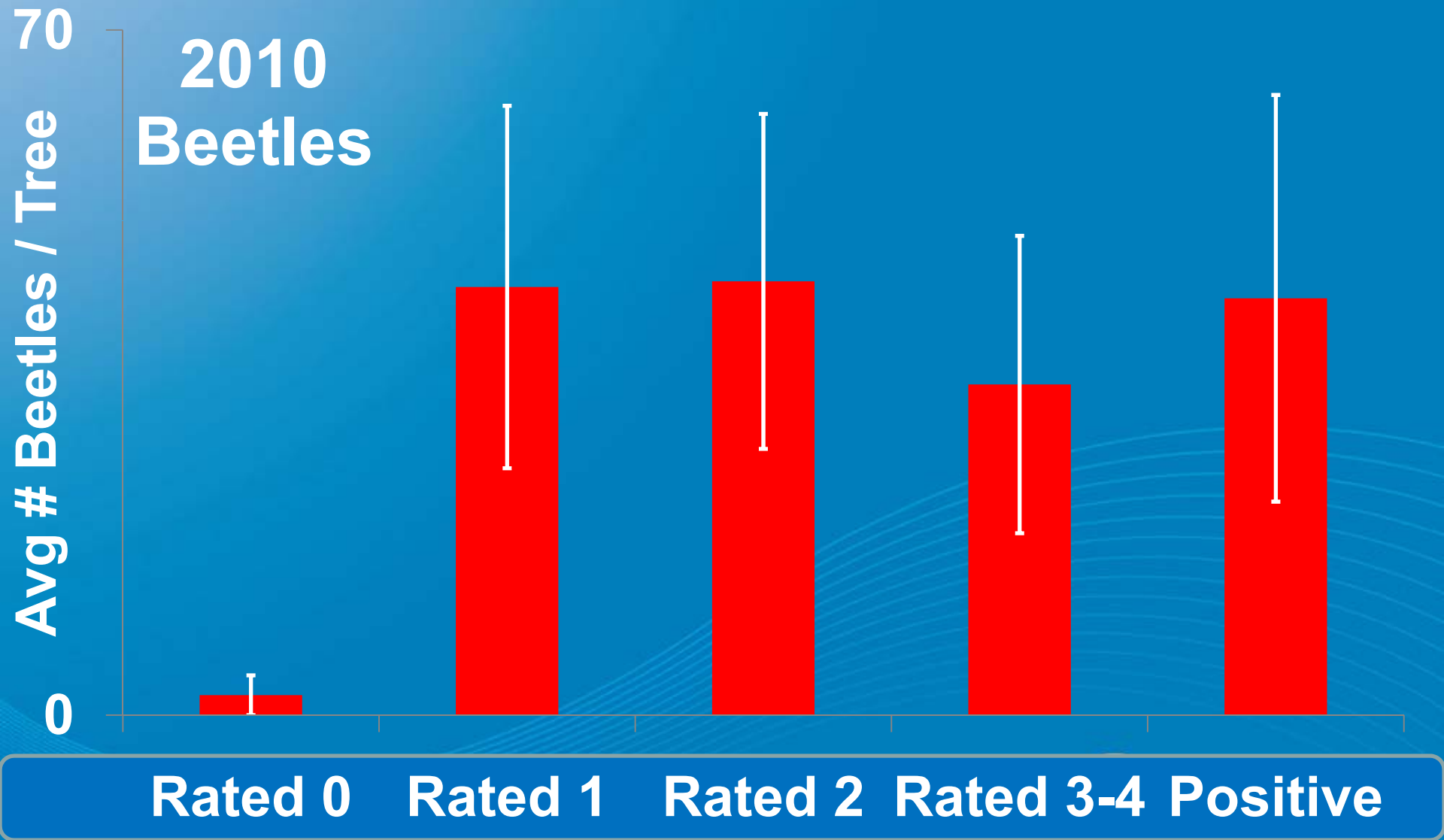
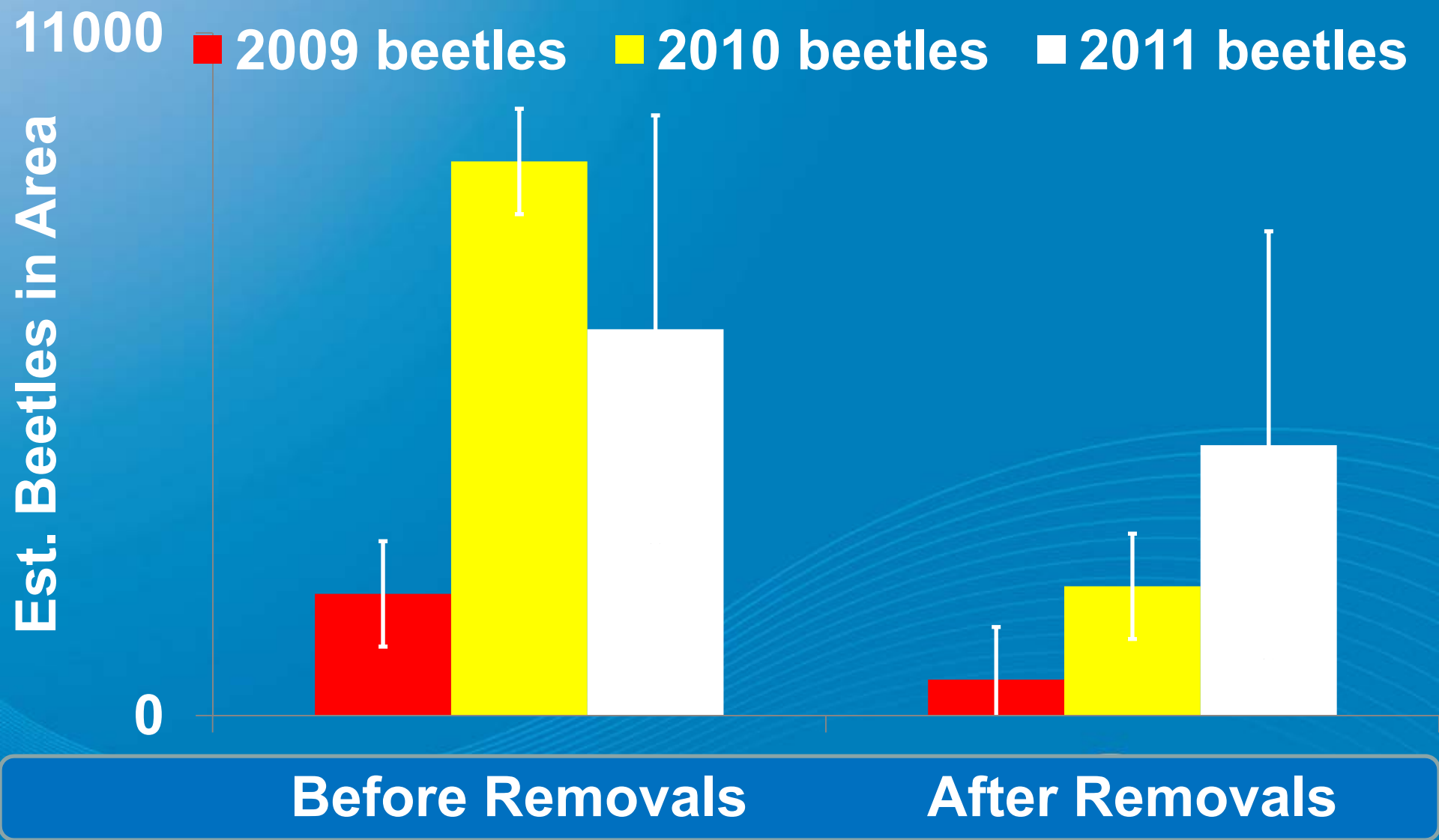
Identifying Beetle Infested Trees

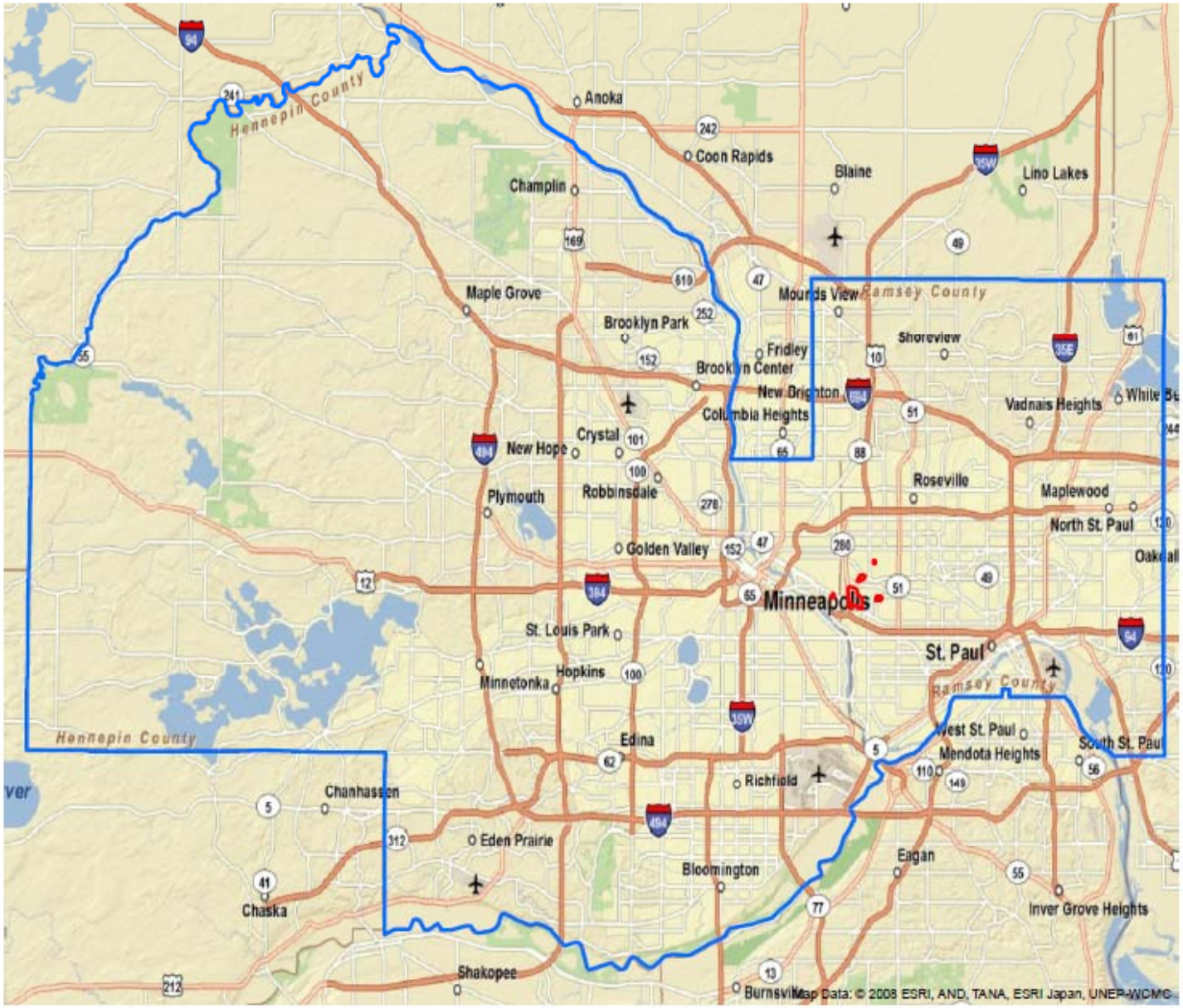


Identifying Beetle Infested Trees

Impact of Removing Infested Trees



Quarantine Boundary vs Infestation



EAB in Minnesota
2010

Legend

- Known EAB-Infested Areas
- State / Federal Quarantine

N

0 3 6 Miles

Map updated 4/5/2010

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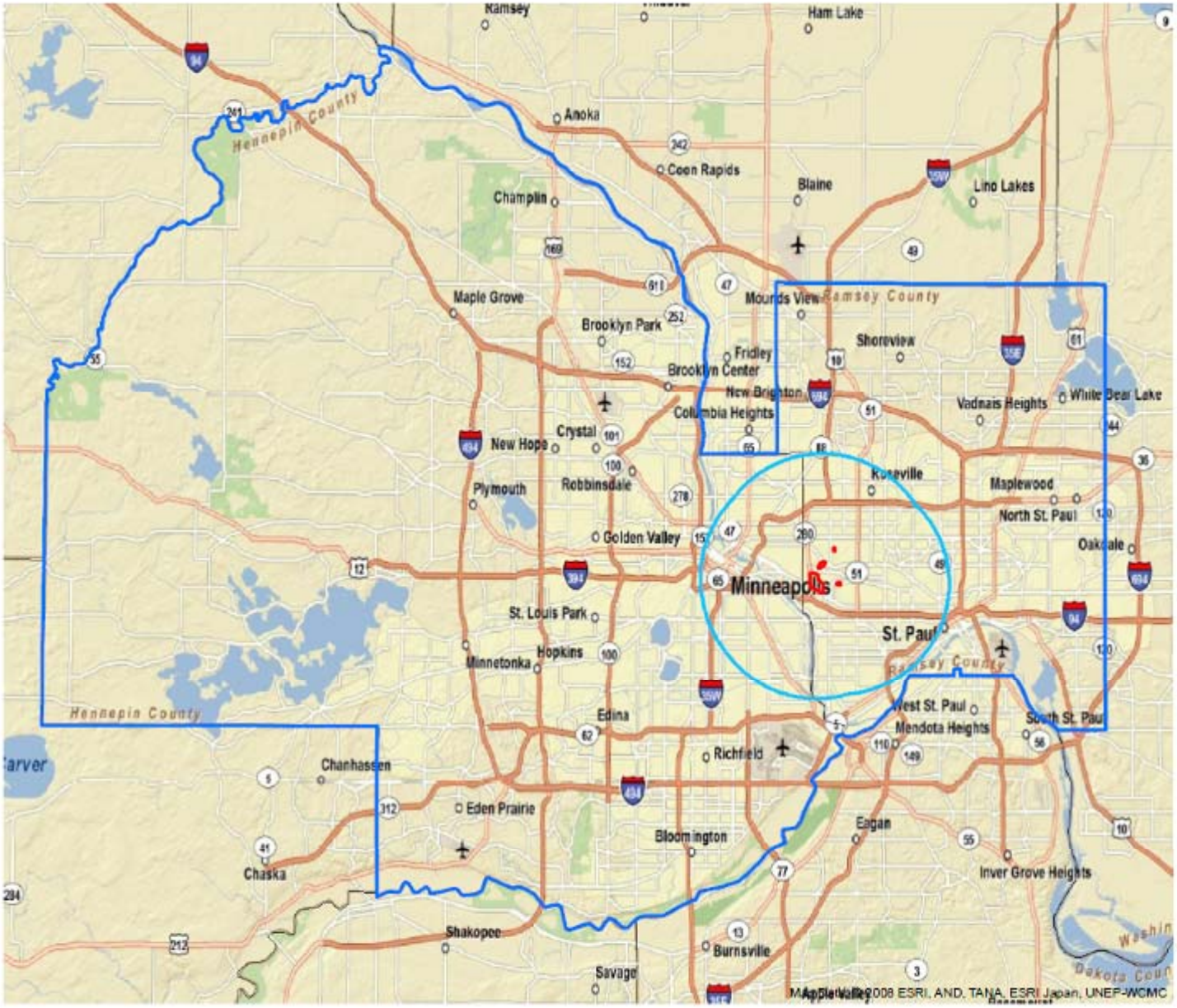
Nested Quarantine?



2009 EAB Quarantine

- Known EAB-Infested Areas
- Regulatory Focus Area 11.5
- State / Federal EAB Quarantine

N

0 3 6 Miles

Map updated 12/15/2009

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Area of Detail Highlighted in Red

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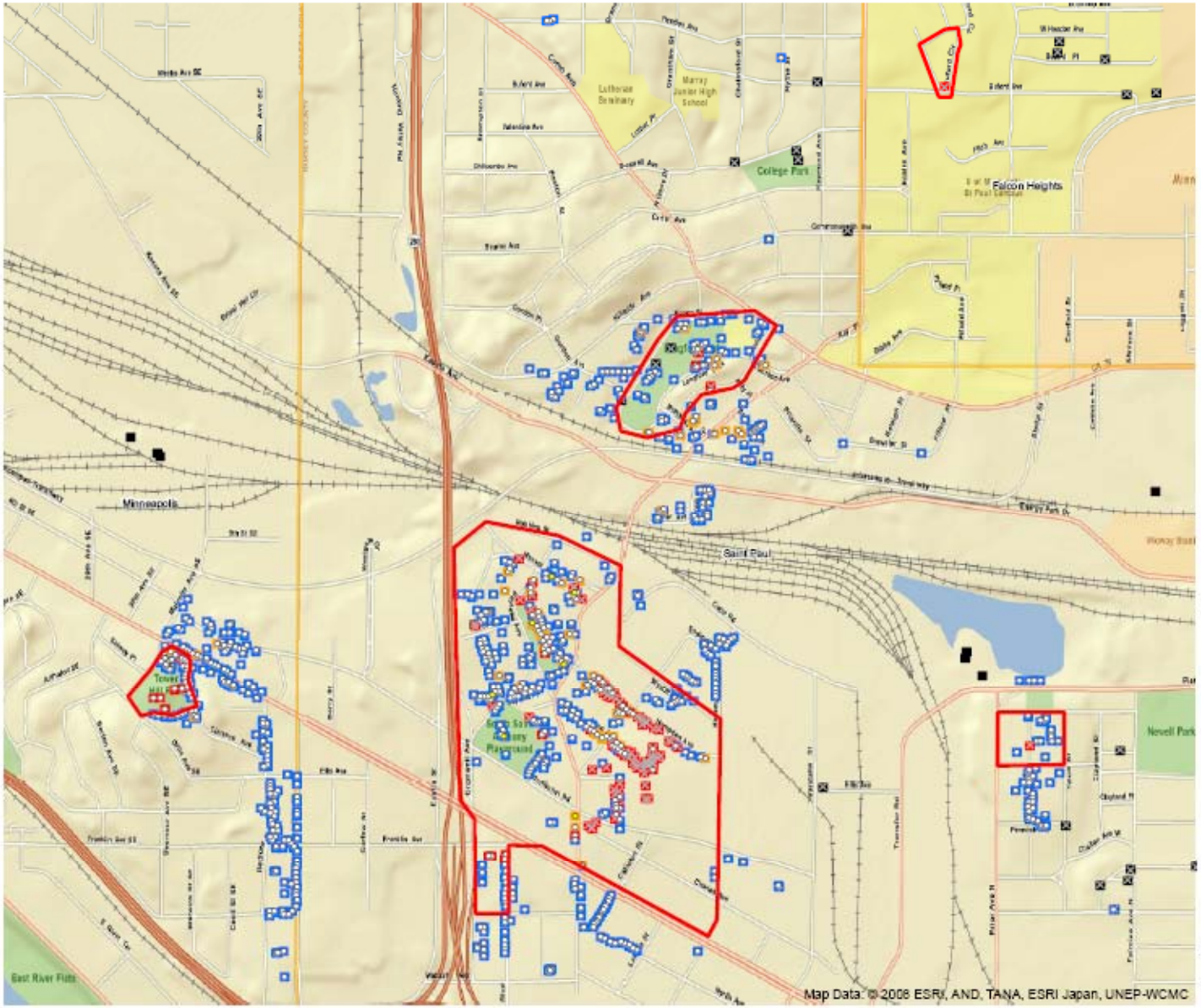
Known EAB-Infested Areas



2010 Known EAB-Infested Areas

Known EAB-Infested Areas

Tree Condition

- Removed
- Standing; Girdled
- Standing; Not Girdled

EAB Status

- Positive
- Suspect
- Not Suspect
- Negative

N

0 0.09 0.18 Miles

Map updated 2/12/2010

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BMP's for Known Infested Areas

- Recommendations, not requirements
  - Avoid pruning / removal during flight season
  - Risk of emergence during transport or after dumping
  - If work is necessary, chip on-site and grind as needed as close to site as able

EAB Life Stage	J	F	M	A	M	J	J	A	S	O	N	D
Immature (under bark)												
Adult (free living)												

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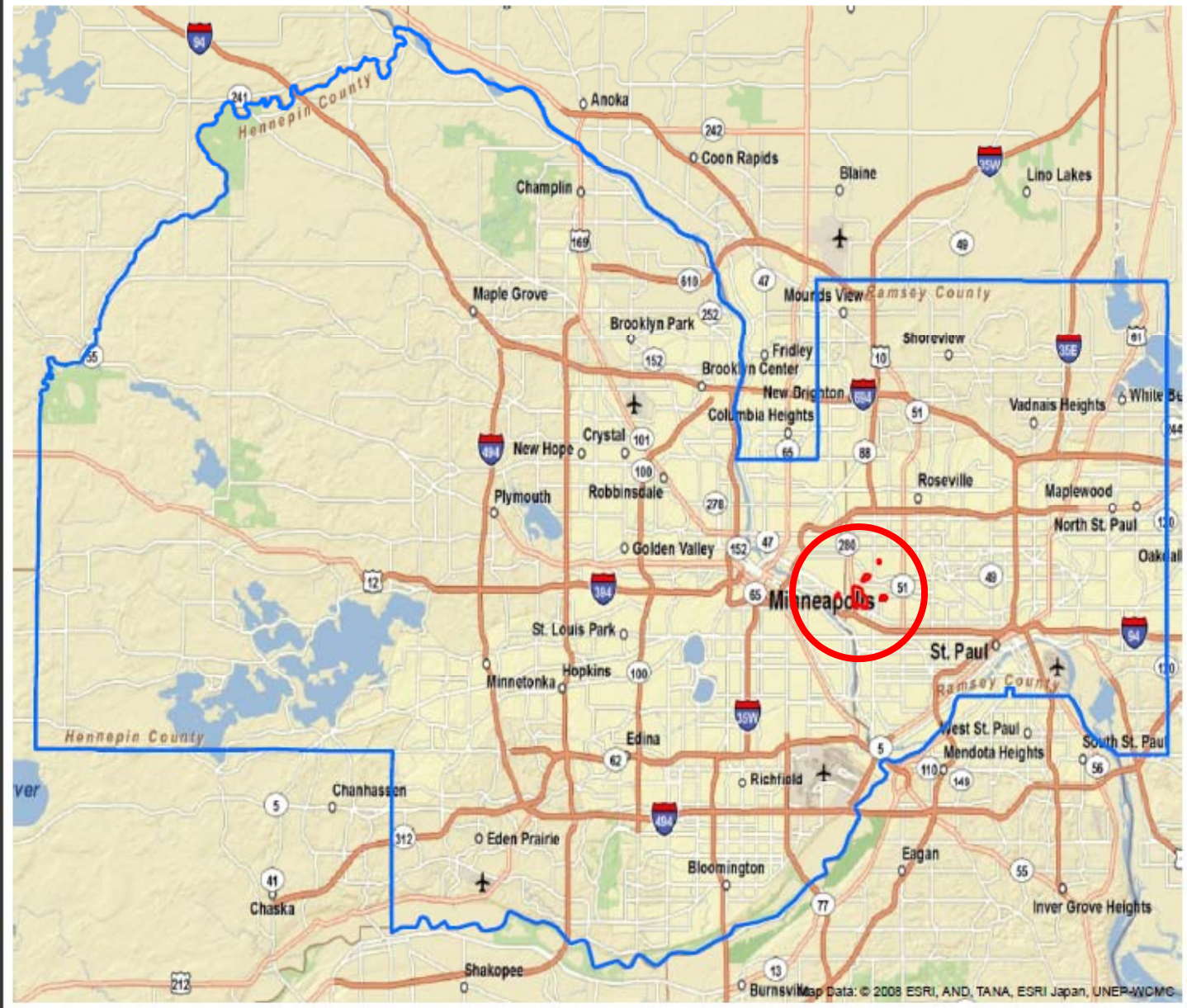
BMP's Meant for Infested Areas



EAB in Minnesota
2010

Legend

- Known EAB-Infested Areas
- State / Federal Quarantine

N

0 3 6 Miles

Map updated 4/5/2010

Area of Detail Highlighted in Red

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BMP's for Rural Areas?

- Non-flight season coincides w/ forestry practices for black ash?
- Other aspects of EAB biology that can be exploited?
  - Research into cold tolerance

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EAB Cold Tolerance Research in Minnesota

Mark Abrahamson, MN Dept Agriculture
Rob Venette, US Forest Service

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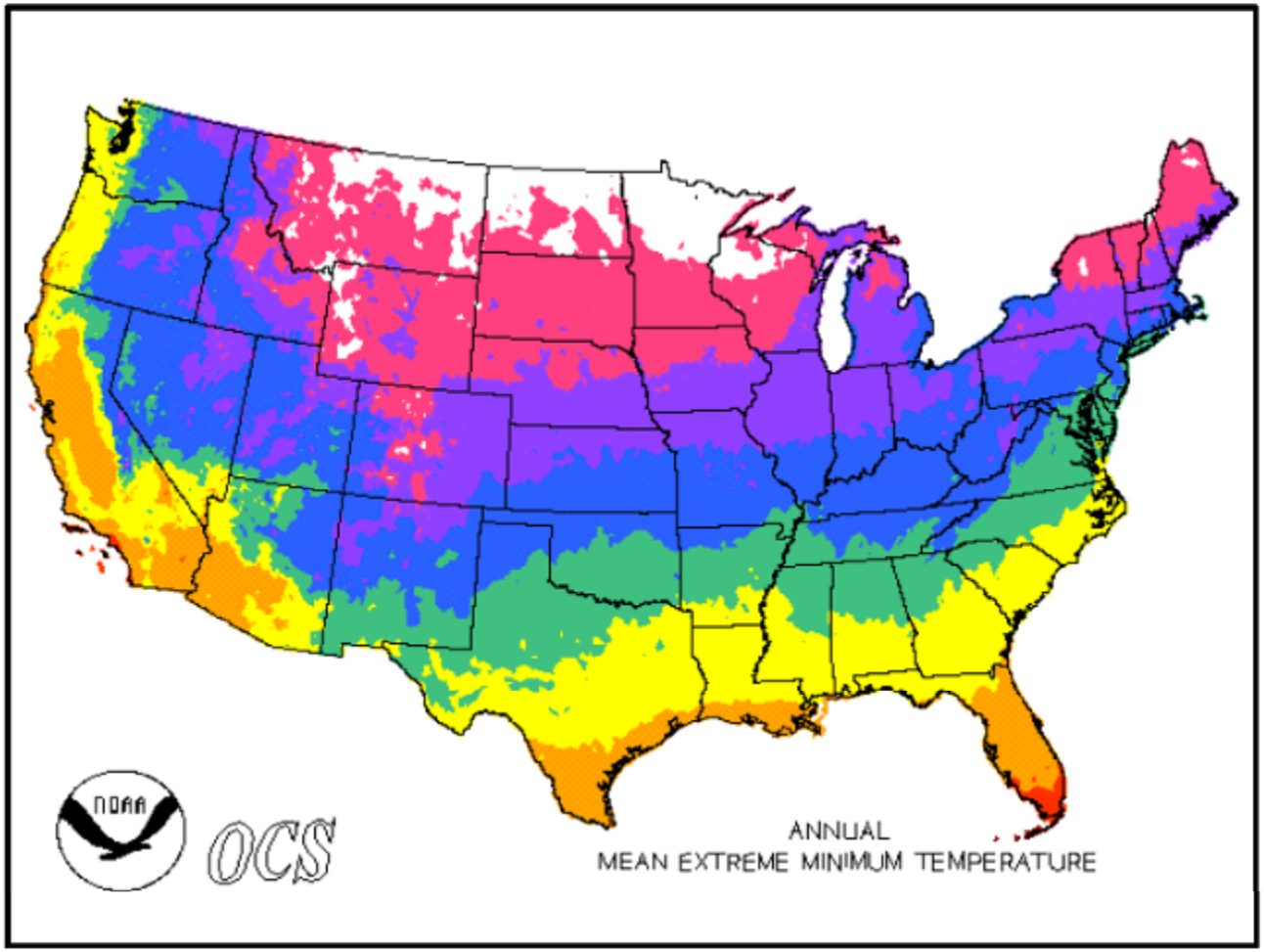
Northern Minnesota Gets Cold!

ESRI ArcExplorer 1.1



STATES

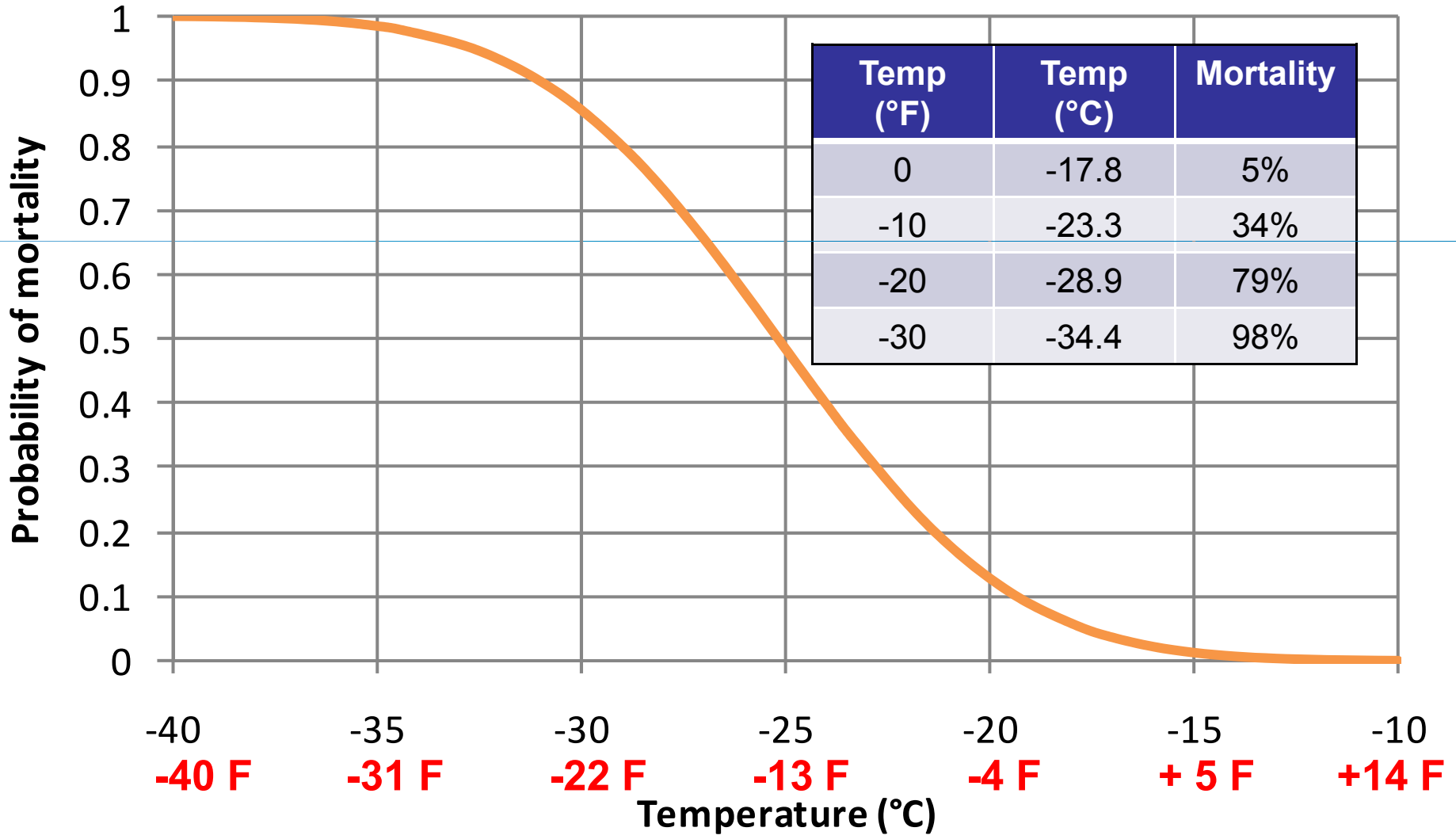
13 MEAN EXTREME MIN TEMP (DEG_F)

- ANNUAL -
A < -30.0
B -30.0 - -20.0
C -19.9 - -10.0
D -9.9 - 0.0
E 0.1 - 10.0
F 10.1 - 20.0
G 20.1 - 32.0
H 32.1 - 40.0
I > 40.0

TITLE

N

Model of the effects of extreme low temperature on EAB mortality



Temp (°F)	Temp (°C)	Mortality
0	-17.8	5%
-10	-23.3	34%
-20	-28.9	79%
-30	-34.4	98%

EAB Winter Field Study

- Assess larval mortality under moderate and extreme cold conditions
- Hypothesis: Colder winter conditions = greater larval mortality
- Removed logs (~20” long) from 3 EAB-infested ash trees in St Paul

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EAB Winter Field Study

- Assigned 20 logs to each of 5 treatments

1. Initial assessment – dissected immediately
2. Freezer treatment – cooled to -35 C (-31 F)

3. Cool room – stored at 10 C (50 F)
4. St Paul – held outside
5. Grand Rapids Area – held outside

- Logs in treatments 3-5 held for 5.5 weeks, then dissected

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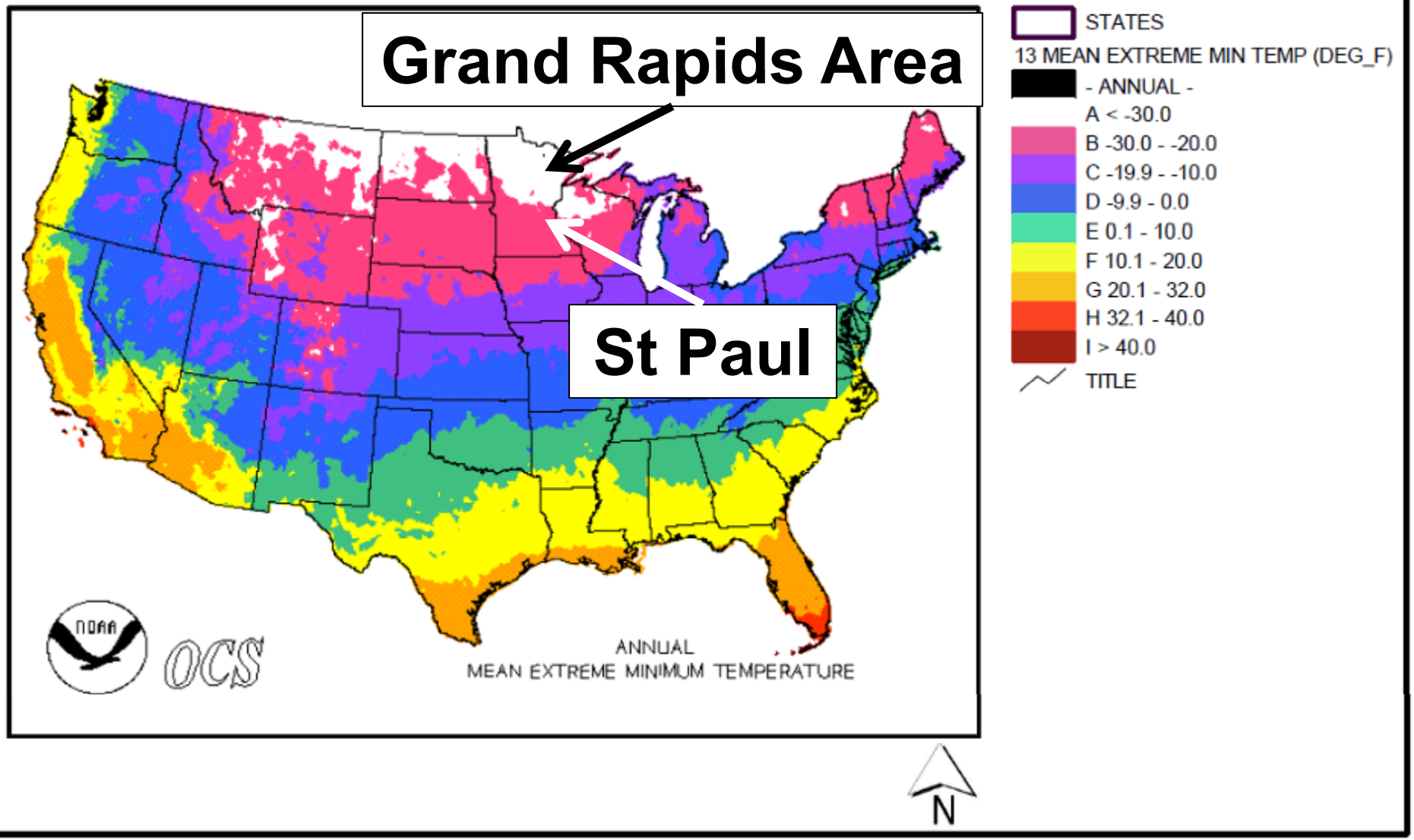
EAB Winter Field Study

ESRI ArcExplorer 1.1



Precautions

(Photo by M. Abrahamson, Minn. Dept. Agricult
TMENT

Temperatures in treatments

Log (diameter)		Temperature (°C)			Predicted mortality (%)
		Air Temp	Warm face	Cool face	
Freezer					
F5 (10.9 cm)		NA	-34	-37	97-99
F2 (25.5 cm)		NA	-25	-33	48-96
"Grand-Rapids" area					
GR4 (10.9 cm)	**-29 F**	-34	-36	-36	99
GR8 (35.6 cm)		-34	-32	-32	93
St. Paul					
SP2 (13.0 cm)	**-18 F**	-28	-28	-28	73
SP17 (35.6 cm)		-28	-26	-28	57-78
Cooler					
C6 (10.2 cm)	**+ 39 F**	4	NA	4	0
C1 (40.6 cm)		4	NA	3	0

Condition of larvae following cold treatment

EAB larva with evidence of cold injury.

Cold injury not always evident; movement used as an additional diagnostic.

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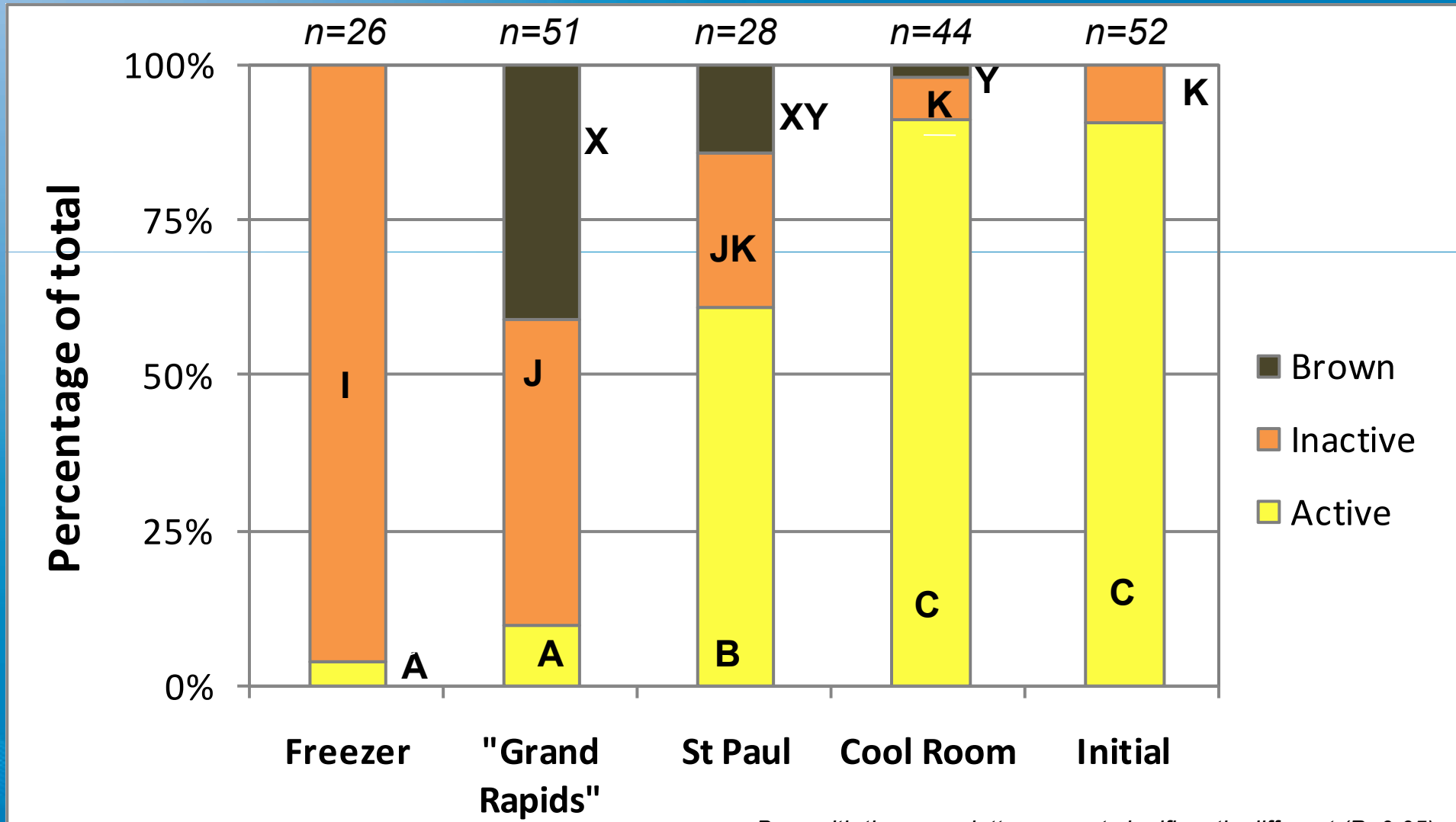
EAB Winter Field Study

- Rated larvae as logs dissected
  - Active – movement
  - Inactive – no movement over 1 day + of observation
  - Brown – discoloration of larva

Larval condition after exposure to different cold treatments



Comparing logs to trees

- St Paul treatment – logs
  - 28 larvae examined
  - 30-40% mortality
- Trees removed during winter/spring 2010 in St Paul and Minneapolis
  - 328 larvae examined
  - 15 - 25% mortality

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Mortality in Trees
Large Larvae vs Small Larvae